

REMARKS

Claims 1-4 and 7-20 are pending in this application, of which 13-20 are withdrawn from consideration. Claims 5 and 6 have been canceled. Reconsideration of the rejections in view of these amendments and the following remarks is respectfully requested.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment, which is captioned "Version with Markings to Show Changes Made."

Rejection under 35 U.S.C. §102(b)

Claims 1-8 stand rejected under 35 U.S.C. §102(b) as being anticipated by Yamada (U.S. Patent No. 5,023,683).

Applicants respectfully traverse this rejection.

Claim 1 has been amended to recite "a **cylindrical-shaped** storage electrode," and "an upper cylinder edge of the storage electrode **being rounded** and having a larger thickness than a thickness in the rest portion."

Thus, the semiconductor device according to the claimed invention has a feature that an upper cylinder edge of the cylindrical-shaped storage electrode is rounded. According to the above-described structure, electric field concentration on the upper cylinder edge of the storage electrode is mitigated to thereby preclude leakage current increase and dielectric breakdown of the capacitor dielectric film.

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On the other hand, the capacitor shown in FIG. 1b of Yamada is not the so-called cylinder-type capacitor. The storage electrode 10b of Yamada does not have a cylindrical-shaped body. The Examiner alleged that Yamada discloses in column 4, lines 48-52 that the storage electrode 10b has a cylindrical shape. However, Yamada only discloses that the sidewall insulation films 9a and 9b are shaped into the hollow pillar-shaped body.

Even assuming, *arguendo*, that the storage electrode of Yamada is interpreted as the cylindrical-shaped storage electrode, the storage electrode of the claimed invention is clearly different from that of Yamada. As described above, the storage electrode of the claimed invention has a feature that the upper cylinder edge is rounded. On the other hand, in Yamada, the upper end of the storage electrode does not correspond to the cylinder edge. The cylinder edge of the storage electrode is located over the insulating film 7a and is not rounded.

Thus, Yamada does not teach or suggest “a **cylindrical-shaped** storage electrode,” and “an upper cylinder edge of the storage electrode **being rounded** and having a larger thickness than a thickness in the rest portion.”

For at least these reasons, claims 1 patentably distinguishes over Yamada. Claims 2-4, 7 and 8, depending from claim 1, also patentably distinguish over Yamada.

Thus, the 35 U.S.C. §102(b) rejection should be withdrawn.

Rejection under 35 U.S.C. §103(a)

Claims 9-12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yamada in view of Nam et al (U.S. Patent No. 6,380,579).

Applicants respectfully traverse this rejection.

Claim 9 also has been amended to recite “a **cylindrical-shaped** storage electrode,” and “the storage electrode being formed of a metal film and having a **larger thickness** at an upper cylinder edge than a thickness in a rest portion.”

Thus, the semiconductor device according to the claimed invention has a feature that an upper cylinder edge has a larger thickness than a thickness in a rest portion. According to the above-described structure, electric field concentration on the upper cylinder edge of the storage electrode is mitigated to thereby preclude leakage current increase and dielectric breakdown of the capacitor dielectric film.

While the storage electrode of the claimed invention has a feature that the upper cylinder edge has a larger thickness than a thickness in a rest portion, the upper end of the storage electrode in Yamada does not correspond to the cylinder edge. The cylinder edge of the storage electrode is located over the insulating film 7a and the thickness of the cylinder edge is not thickened.

Thus, Yamada does not teach or suggest “a **cylindrical-shaped** storage electrode,” and “the storage electrode being formed of a metal film and having a **larger thickness** an upper cylinder edge than a thickness in a rest portion.”

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Nam et al has been cited for allegedly disclosing a capacitor with a storage electrode formed of platinum. Nam et al does not suggest “the storage electrode being formed of a metal film and having a larger thickness at an upper cylinder edge than a thickness in rest portion,” as recited in amended claim 9. Neither does it discuss the electric field concentration on the edge of the storage electrode. Thus, Nam et al does not remedy the deficiencies of Yamada.

For at least these reasons, claim 9 patentably distinguishes over Yamada and Nam et al. Claims 10-12, depending from claim 9, also patentably distinguish over the cited references.

Thus, the 35 U.S.C. §103(a) rejection should be withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosures: Version with Markings to Show Changes Made

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IN THE CLAIMS:

Claims 5 and 6 have been canceled.

Claims 1-4 and 7-12 have been amended as follows:

1. (Amended) A semiconductor device comprising:

a capacitor formed above a semiconductor substrate and including

a cylindrical-shaped storage electrode,

a capacitor dielectric film formed on the storage electrode, and

a plate electrode formed on the capacitor dielectric film,

an upper cylinder edge of the storage electrode having an upper end being rounded and

having a larger thickness ~~at the upper end~~ than a thickness in the rest ~~region~~ portion.

2. (Amended) A semiconductor device according to claim 1, wherein

the storage electrode has a thickness gradually thickened toward to the upper ~~end~~ cylinder edge.

3. (Amended) A semiconductor device according to claim 1, wherein

a side surface of the storage electrode has a side surface is tilted and has a periphery peripheral

length of a cylinder is gradually widened increased toward to the upper ~~end~~ cylinder edge.

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4. (Amended) A semiconductor device according to claim 2, wherein
a side surface of the storage electrode ~~has a side surface~~ is tilted and ~~has a periphery peripheral~~
length of a cylinder is gradually widened increased toward to the upper ~~end~~ cylinder edge.

7. (Amended) A semiconductor device according to claim 5 1, wherein
an inner surface of the storage electrode ~~has~~ at a border portion between ~~the inside~~ a side surface
and a bottom surface is rounded.

8. (Amended) A semiconductor device according to claim 6 2, wherein
an inner surface of the storage electrode ~~has~~ at a border portion between ~~the inside~~ a side surface
and a bottom surface is rounded.

9. (Amended) A semiconductor device comprising:
a capacitor formed above a semiconductor substrate and including
a cylindrical-shaped storage electrode,
a capacitor dielectric film formed on the storage electrode, and
a plate electrode formed on the capacitor dielectric film,
the storage electrode being formed of a metal film and having a larger thickness at ~~the upper~~
~~end~~ an upper cylinder edge than a thickness in ~~the~~ a rest region portion.

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10. (Amended) A semiconductor device according to claim 9, wherein

the storage electrode has a thickness gradually thickened toward to the upper ~~end~~ cylinder edge.

11. (Amended) A semiconductor device comprising:

a capacitor formed above a semiconductor substrate and including

a cylindrical-shaped storage electrode,

a capacitor dielectric film formed on the storage electrode, and

a plate electrode formed on the capacitor dielectric film,

the storage electrode being formed of a metal film and ~~having an upper end~~ an upper cylinder edge
of the storage electrode being rounded.

12. (Amended) A semiconductor device according to claim 11, wherein

the storage electrode has a thickness gradually thickened toward to the upper ~~end~~ cylinder edge.